

Resilience to Nature's Challenges: Distributed Infrastructure Toolbox**Electricity Network Research: Summary as at May 2019**1. Background

Resilience to Nature's Challenges Kia manawaroa - Ngā Ākina o Te Ao Tūroa (RNC) aims to partner researchers with stakeholders, including communities, to build shared understandings of natural hazards and risks, and to work together to develop practical risk reduction solutions. The RNC framework is intended to promote collaboration between infrastructure stakeholders and the New Zealand research community.

The resilience of lifeline networks like electricity, transportation and water is critical in enabling society to recover rapidly after a major disaster. The Distributed Infrastructure programme is developing tools to assess the performance of spatially-distributed infrastructure networks subject to extreme natural hazards. Working closely with relevant stakeholders, the programme is developing methodologies to quantify system-level performance of infrastructure networks when subject to natural hazards and cascading impacts, leading to improved resilience of communities through identification of multi-hazard related vulnerabilities in infrastructure critical for NZ society. More about this programme can be found here [link](#).

2. RNC-supported research to date

Research title: Impacts of the Kaikoura EQ on Electricity Networks (2016-2017)

Research partners: Transpower, Mainpower,

Principal outcomes: Summary of preliminary observations of performance of transmission and distribution electricity networks across affected regions and adaptations that were made to enable the provision of services.

Status: Complete.

Outputs: Journal paper - [link](#)

Research title: Electric power distribution system resilience modelling toolbox (2016-2020)

Partners: Westpower, MainPower

Principal outcomes: Framework for the quantification of the functional impacts of natural hazards on electric power distribution systems. Assessment of the influence of substation typology and network structure on the risk to provision of power.

Status: Ongoing

Outputs: Journal paper in preparation.

Research title: Effective Power Restoration Practices following extreme natural hazards (2018-2020)

Partners: Westpower, MainPower

Principal outcomes: To develop strategies for how to re-energize an electrical network after a blackout.

Status: Ongoing

Outputs: Conference papers (not publically available). Journal paper in preparation.

Research title: A Framework for Islanded Microgrid Operation after Hazard Events (2017-2020)

Partners: Westpower, Horizon Networks

Principal outcomes: To provide possibilities to strategically manage the available resources to restore electricity and the grid is unavailable.

Status: Ongoing

Outputs: Conference papers (not publically available). Journal paper in preparation. - [link](#)

Research title: Asset management of high voltage underground cables factoring resilience (2018-2021)

Partners: Orion Ltd

Principal outcomes: Incorporating asset management to resilience framework to determine the health and criticality of HV underground cables.

Status: Ongoing

Outputs: Poster - [link](#)

Research title: Distribution Network Protection to Improve Resilience (2018-2019)

Partners: Westpower

Principal outcomes: To investigate and develop lines' protection algorithms to increase power system reliability.

Status: Ongoing

Outputs: Conference papers (not publically available).